The Light Naval Gun Mount MN 27 GS for the CIGS program

Dr. Klaus Grünewald, Mauser-Werke, Oberndorf

34th Gun & Ammunition Symposium & Exhibition
Monterey, April 26 - 29, 1999

MAUSER
Member of Rheinmetall Group

MN 27/30 GS

- *Mauser Naval Activities*
- *MN 27 GS*
  - History / Status
  - Operational Requirements
  - System Design / Performance
  - FC - Concept
  - Gun & Ammunition Family
  - System Simulation
- *CIGS Aspects*

MAUSER

Member of Rheinmetall Group

Mauser Naval Activities

- *MK 30 mm x 173*
  - Breda Single Naval Mount
  - Breda Twin Compact Naval Mount
  - MSI DS 30 F
  - MN 30 GS
- *BK 27 mm x 145*
  - MN 27 GS (German Version: MLG 27)
  - MIDAS/DRAKON CIWS
- *Rh 202 MK 20 mm x 145*
  - S 20 Man-driven Mount

MAUSER

Member of Rheinmetall Group

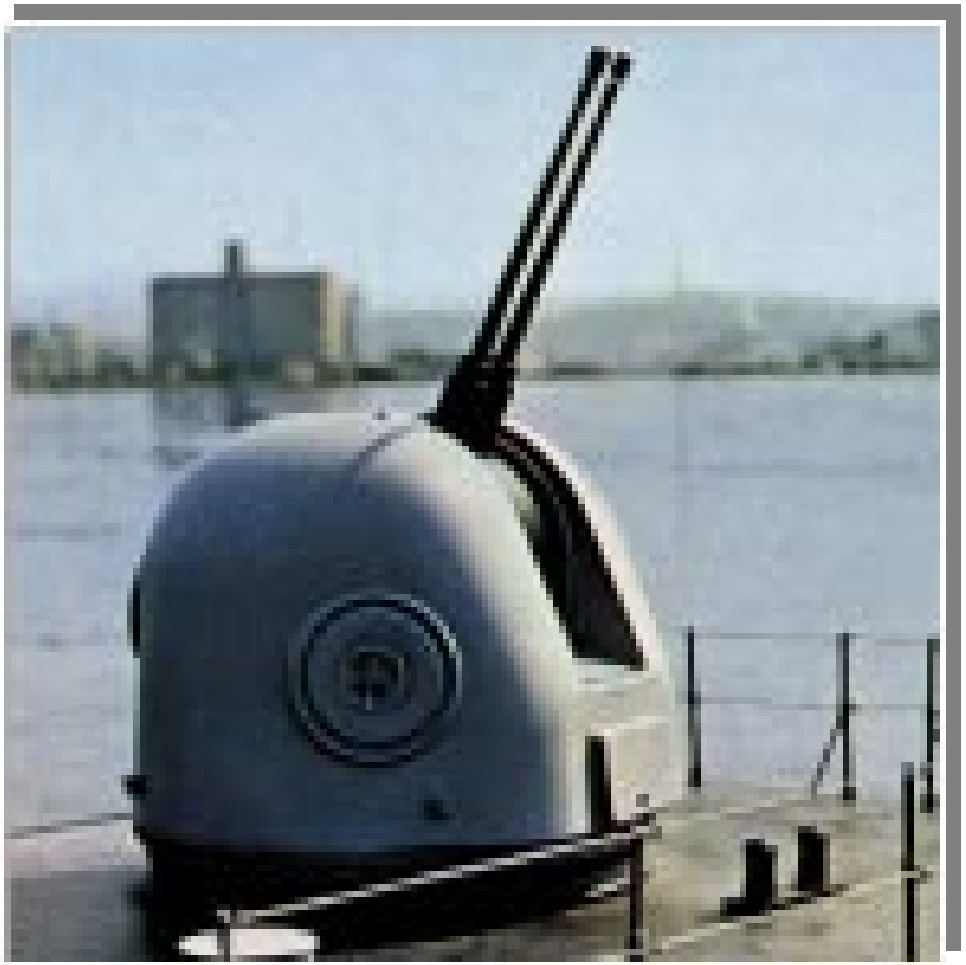
MN 27/30 GS

Breda Single Compact Mount

MAUSER

Member of Rheinmetall Group

MN 27/30 GS



Breda Twin Compact
Mount

MAUSER

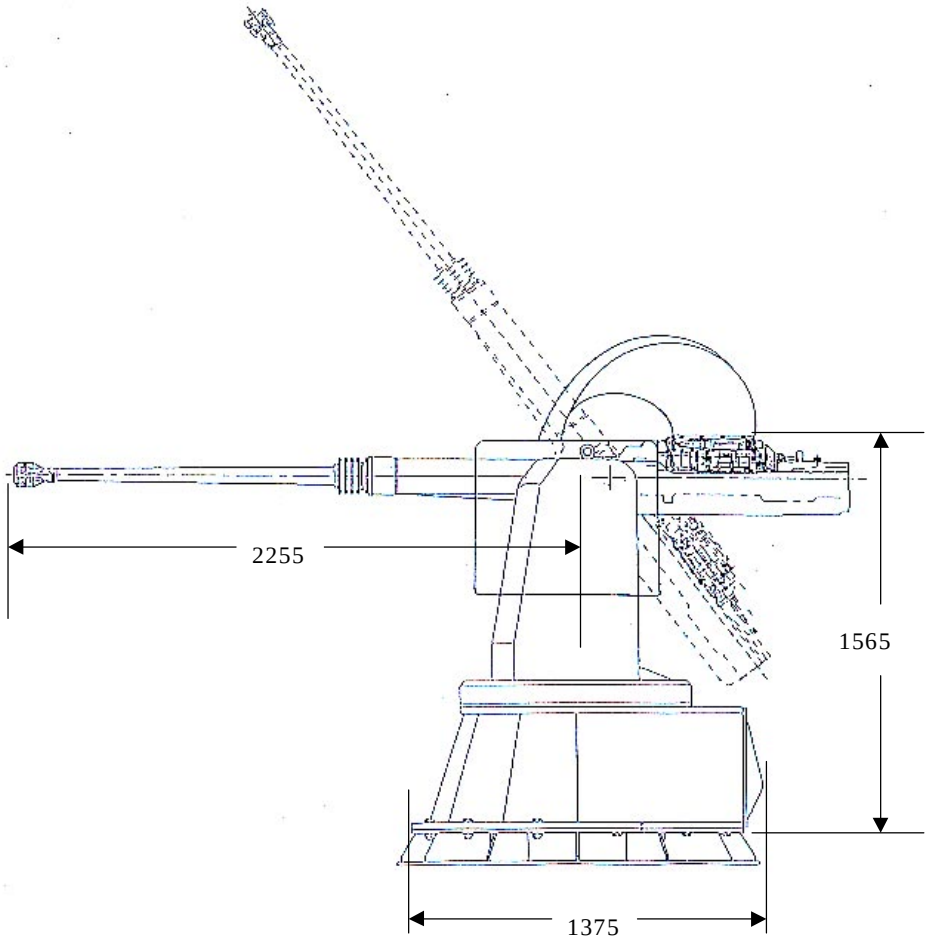
Member of Rheinmetall Group

MN 27/30 GS

DS 30 F
MSI Mount

MAUSER
Member of Rheinmetall Group

MN 27/30 GS

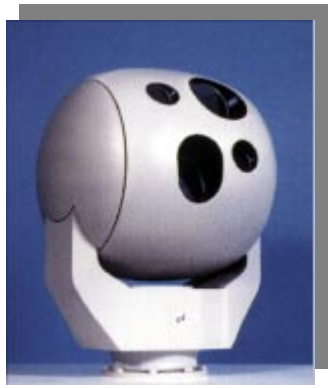


MN 30 GS

MAUSER

Member of Rheinmetall Group

MN 27/30 GS



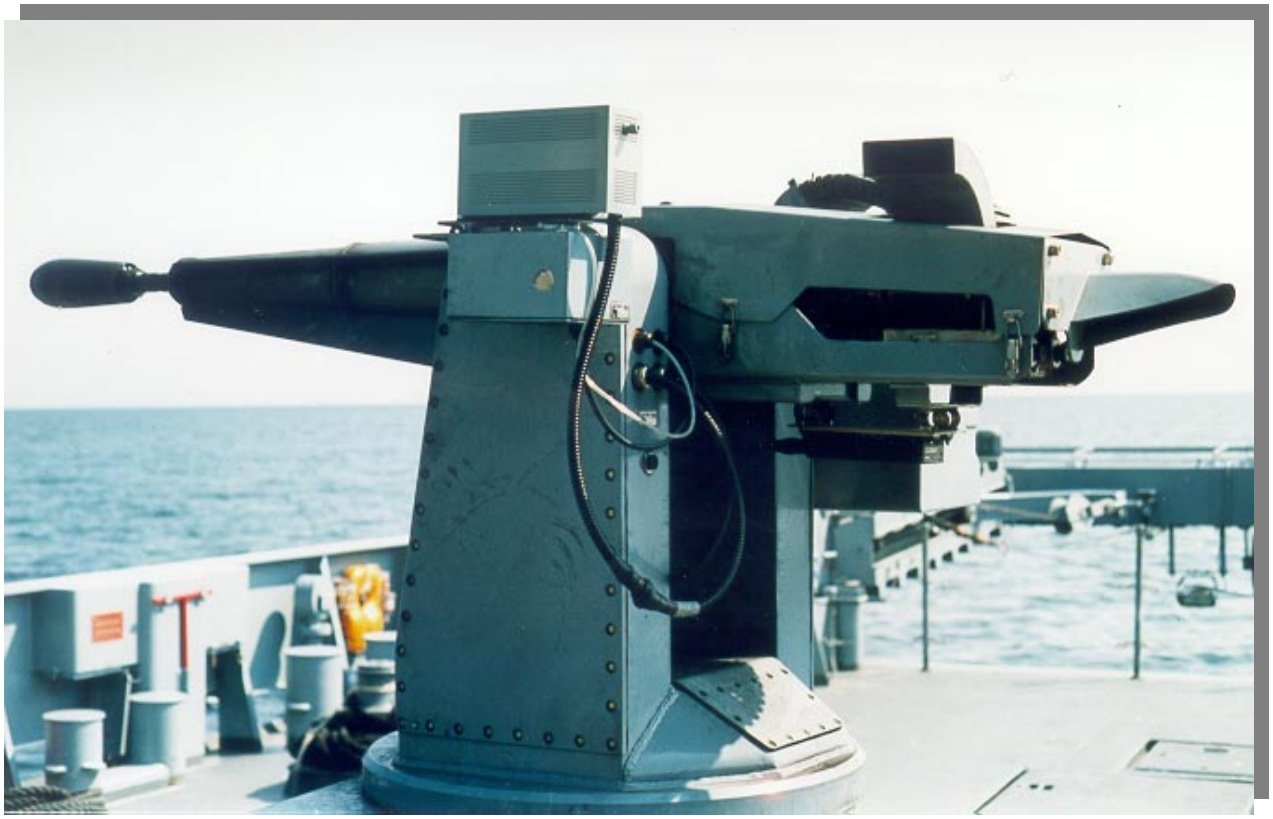
CIWS

DRAKON EO

MAUSER

Member of Rheinmetall Group

MN 27/30 GS

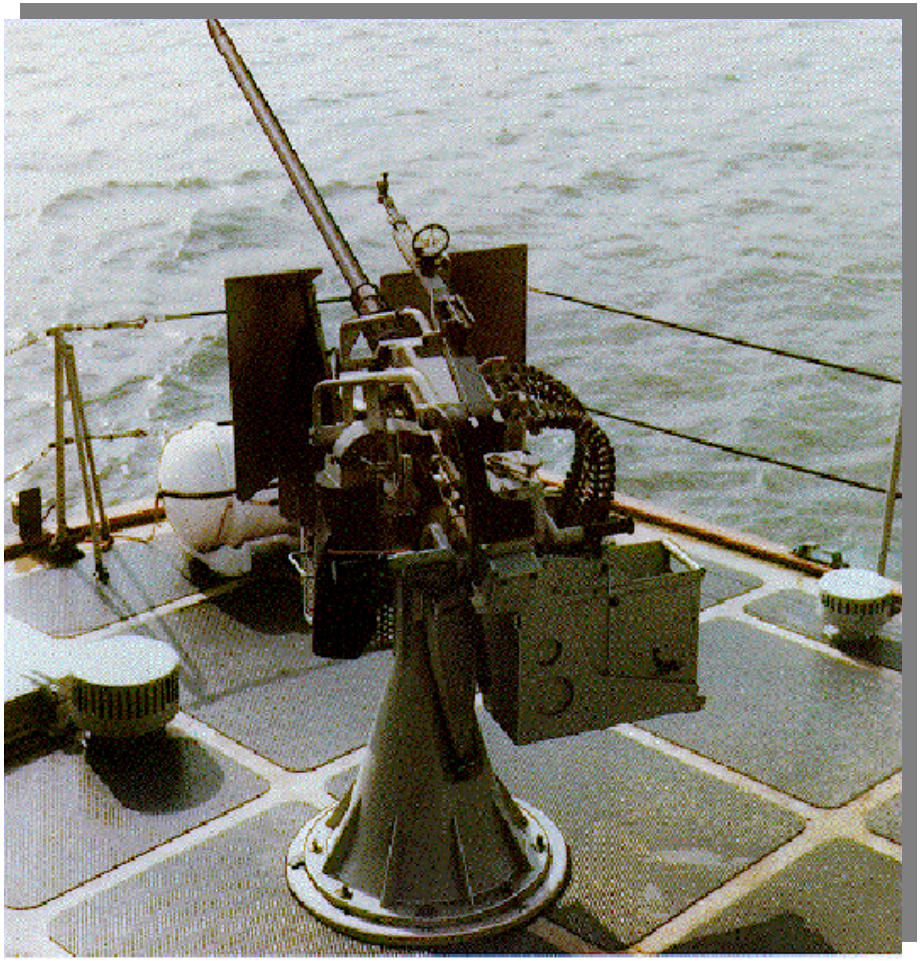


MN 27 GS

MAUSER

Member of Rheinmetall Group

MN 27/30 GS



S 20

MAUSER

Member of Rheinmetall Group

MN 27/30 GS

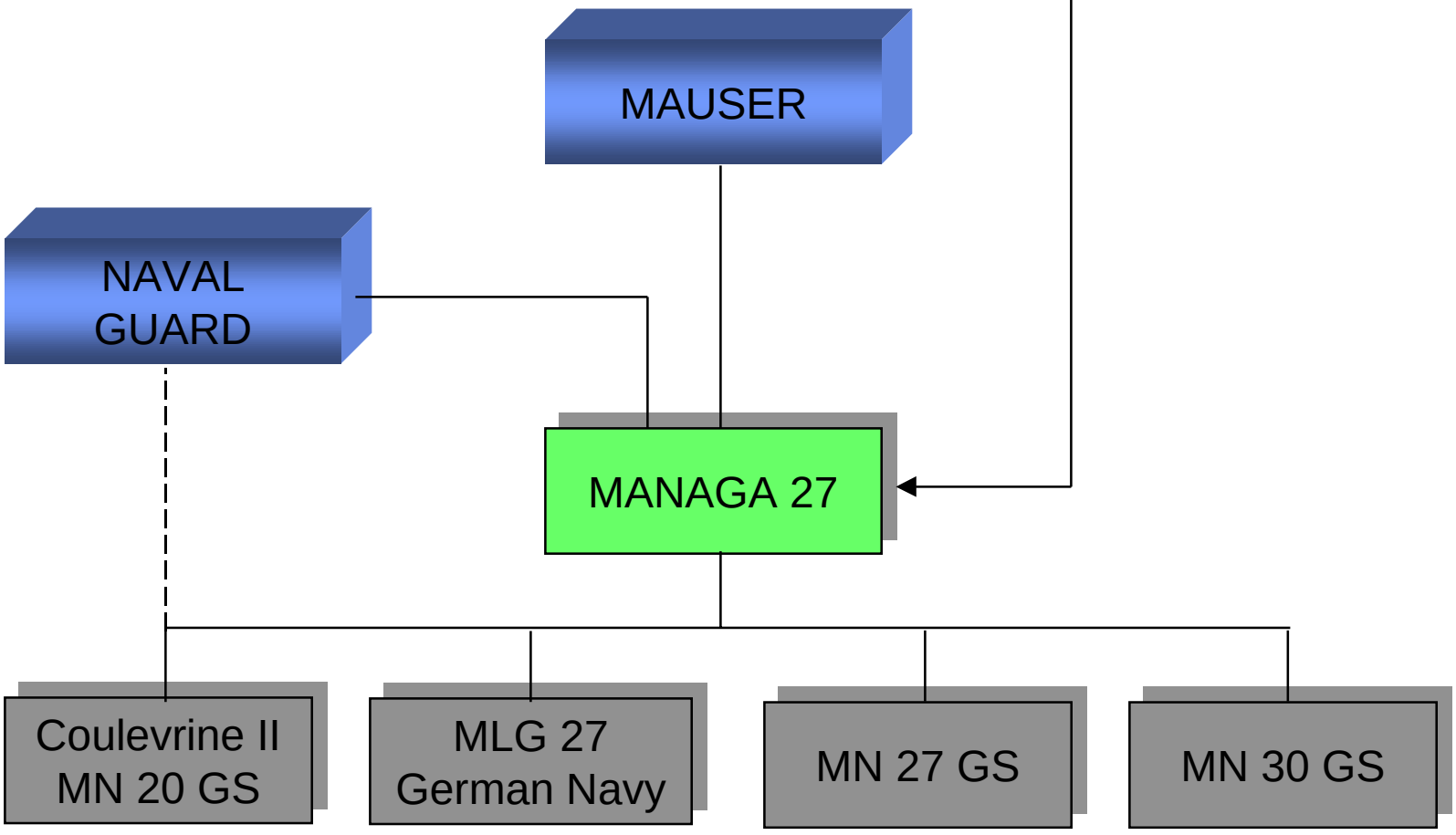
MN 27 GS

Rate of fire:	1.700 rpm
Calibre:	27mm x 145
Elevation:	-15° up to 60°
Traverse:	+/- 170°
Ammunition:	TP,TP-D, HESD, MP, SAPHE, FAPDS, APFSDS
Total weight:	1100 kg
No Deck Penetration	

MAUSER

Member of Rheinmetall Group

MN 27/30 GS



MAUSER

Member of Rheinmetall Group

MN 27/30 GS

MN 27 GS

Prototype tested

on the Baltic Sea

in April 96

MAUSER

Member of Rheinmetall Group

MN 27 GS Status

- Prototype tested; Qualification of MLG 27 for German Navy in 1999/01;
- Replacement of 20 mm and 40 mm Mounts for German Navy starting after Qualification
- Production Lead Time: 18 Months
- Weight (including FCS Sensors): <1000 kg
- Training Radius: 1630 mm
- Elevation: -15° to +60° Traverse: +/-170°
- Velocity: 60°/s Acceleration: 120°/s²
- Ammunition Box Capacity: 90/135 rds
- Max. Rate of Fire: 1700 rds/min
- Effective Range
  - Full Calibre: 2.7 km
  - Sub-calibre: 4.0 km

MAUSER

Member of Rheinmetall Group

MN 27/30 GS

- Main Armament for smaller Vessels
- Side Armament for Ships
- Upgunning of 20 to 40 mm Equipment
- Modular with respect to Gun Calibre, FCS and Modes of Operation
- Most economic solution

MAUSER

Member of Rheinmetall Group

MN 27/30 GS Operational Requirements

CLOSE-IN SELF DEFENSE

- Anti Aircraft
- Anti Helicopter
- Surface Targets Speedboats
- Floating Mines
- Shore Targets
- Sea Policing

- Effective Range 200 to 4000 m
- High Rate of Fire 200 -1700 rds/min
- Effective Ammunition
- Remotely controlled
- Man or automatically operated

SYSTEM DESIGN

MLG 27

Remotely Controlled, Man Operated, Standardised Weapon System for Fleet-wide Use in one Configuration:

- Complete EO Sensor Package on the Mount
- Own dedicated Control Console
- Interface to NCS optional

SYSTEM DESIGN

MN 27/30 GS

Remotely Controlled, Modular System for Integration of different Weapons and different Fire Control Options:

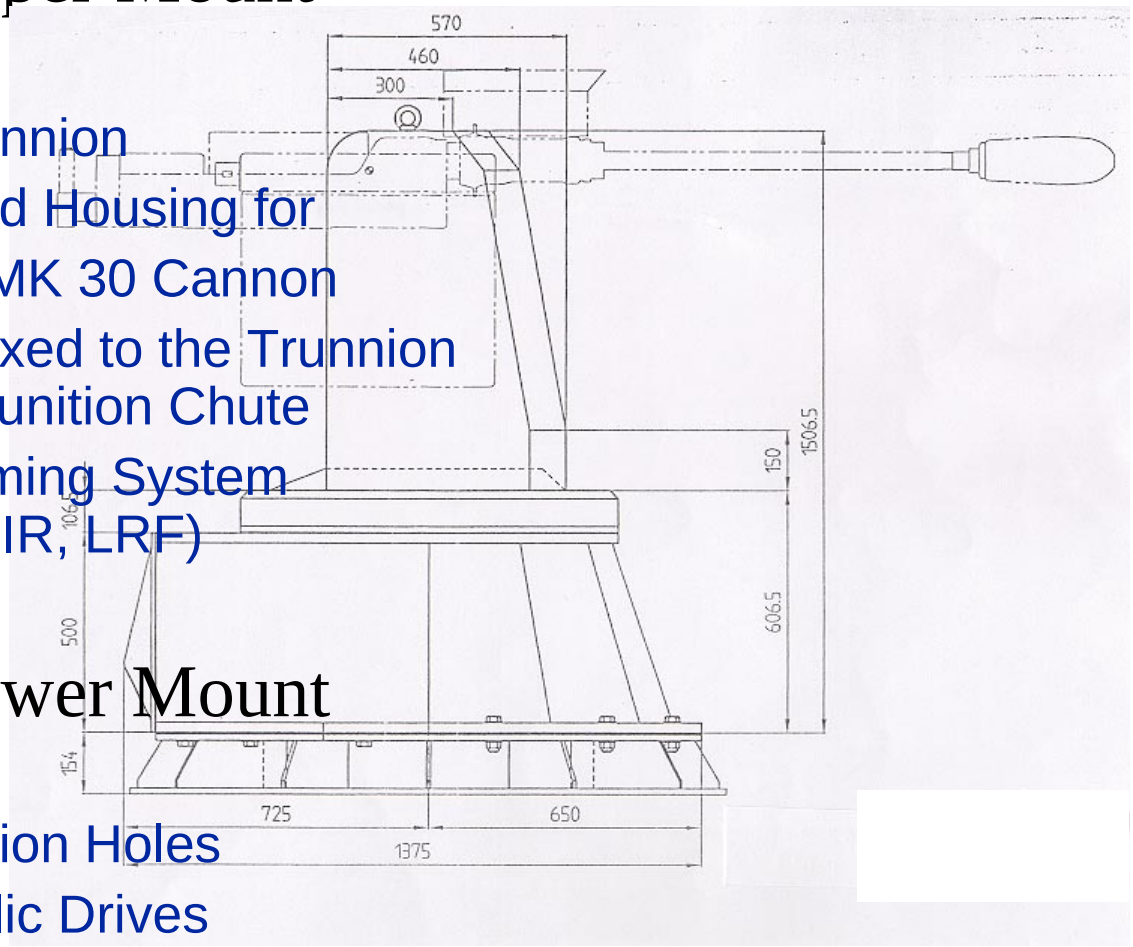
- BK 27 x 145; MK 30 x 173; Rh 202; (M242; Bush II)
- on-Mount or on-Board EO/Radar Sensors
- Hydraulic or Electric Drives
- Standard Interface RS 422; CCIR Video Norm
- 24 VDC, 0.5 kW; 380 V 50 Hz or 400 V 60 Hz, 3 kW

MN 27/30 GS

Gun Mount - Upper Mount

Assemblies:

- Turntable with Trunnion
- Weapon Guide and Housing for
- Mauser BK 27 or MK 30 Cannon
- Ammunition Box fixed to the Trunnion and Flexible Ammunition Chute
- Electro-Optical Aiming System (CCD-Camera, FLIR, LRF)
- Gyros



Gun Mount - Lower Mount

Assemblies:

- Base with Installation Holes
- Electric or Hydraulic Drives
- Weapon Control Unit

MAUSER

Member of Rheinmetall Group

SYSTEM OPERATION

Remotely controlled System Operation by the Gunner from the Operators Console

- Mount Operation
- Control of Electro-Optical Aiming System
- Determination of Fire Control Parameters
- Target Lock-On
- Engagement

Fire Control Concept

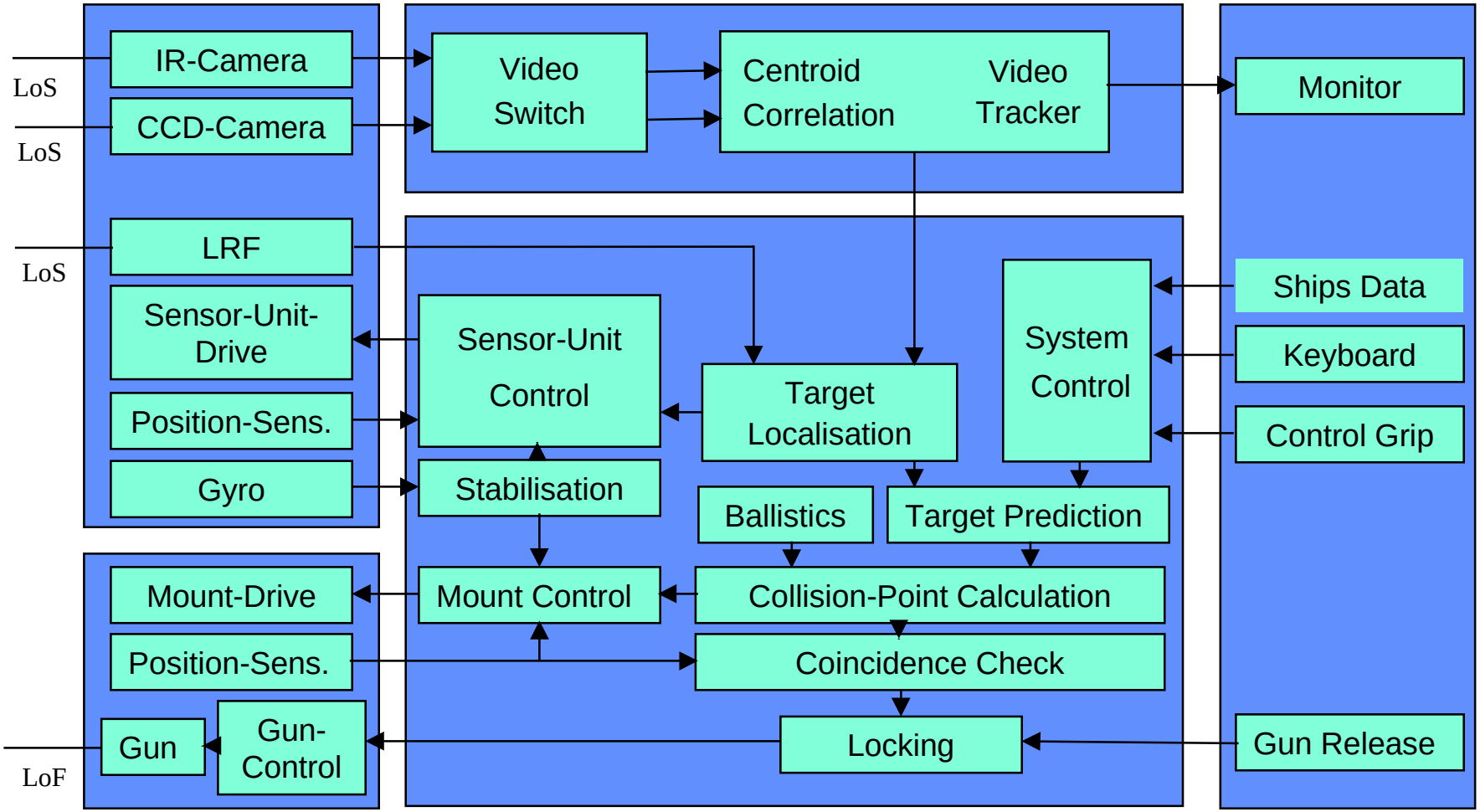
Remotely positioned Gunner at the Control Console

Autonomous Mode (1) Manual	*Autonomous Mode (2) Semiautomatic*	*Depending on NCS (3) Automatic Mode*
<u>On the Mount:</u>		
TV Camera Daylight and optionally IR	TV Camera Daylight and IR Laser Range Finder	TV Camera Daylight IR optionally
<u>On the FC-Console:</u>		
Monitor	Monitor	Monitor for Witnessing only
Range (Super-elevation) & Lead Angle estimated	Target Search & Desgt. by Gunner or external	External Search & Designation
Control Handle for Search,Track and Weapon Release	Control Handle for Search and Lock-On Tracker, Weapon Release by Gunner	External Track Automatic Weapon Release

MAUSER

Member of Rheinmetall Group

MN 27/30 GS

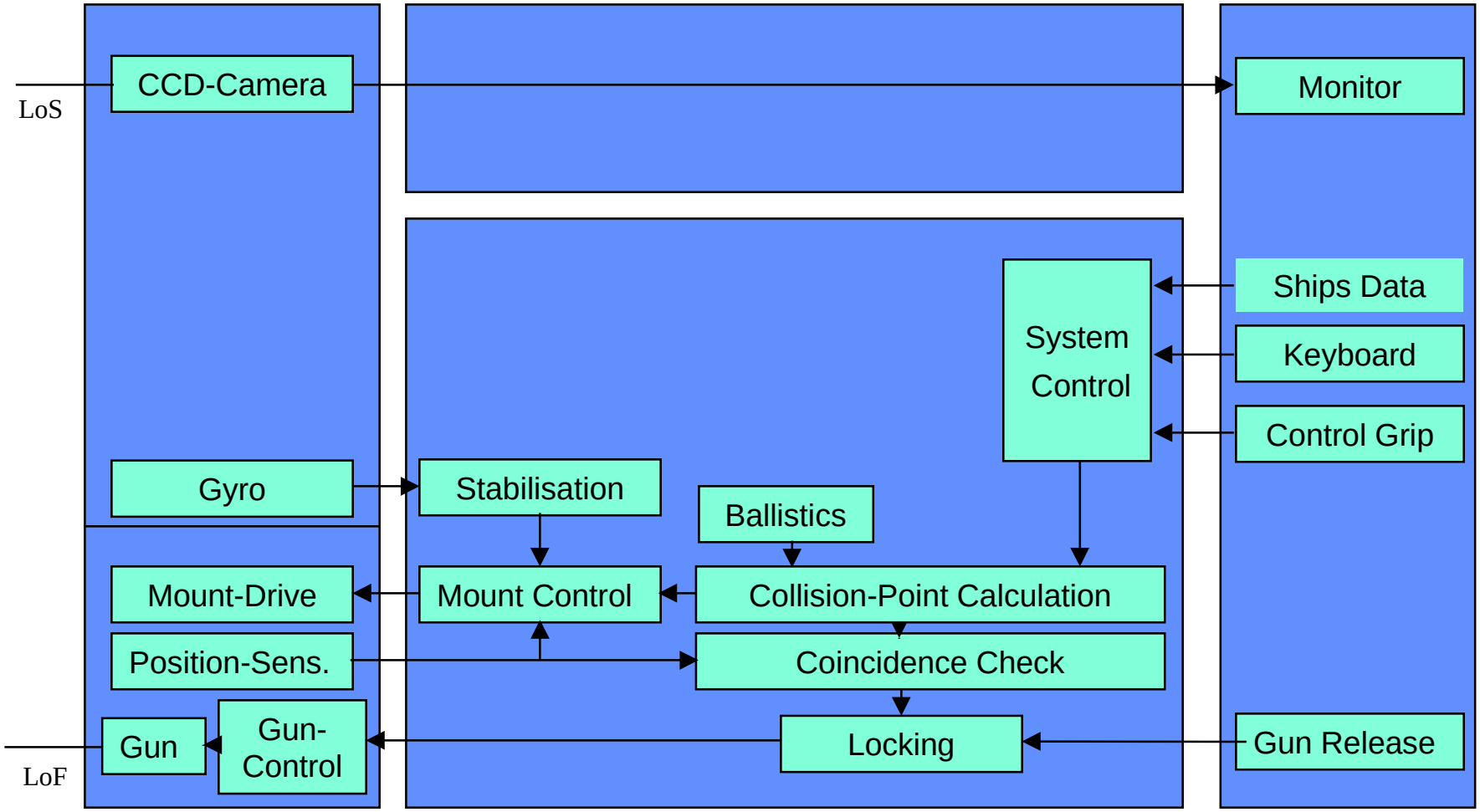


FCS (Full Scale)

MAUSER

Member of Rheinmetall Group

MN 27/30 GS



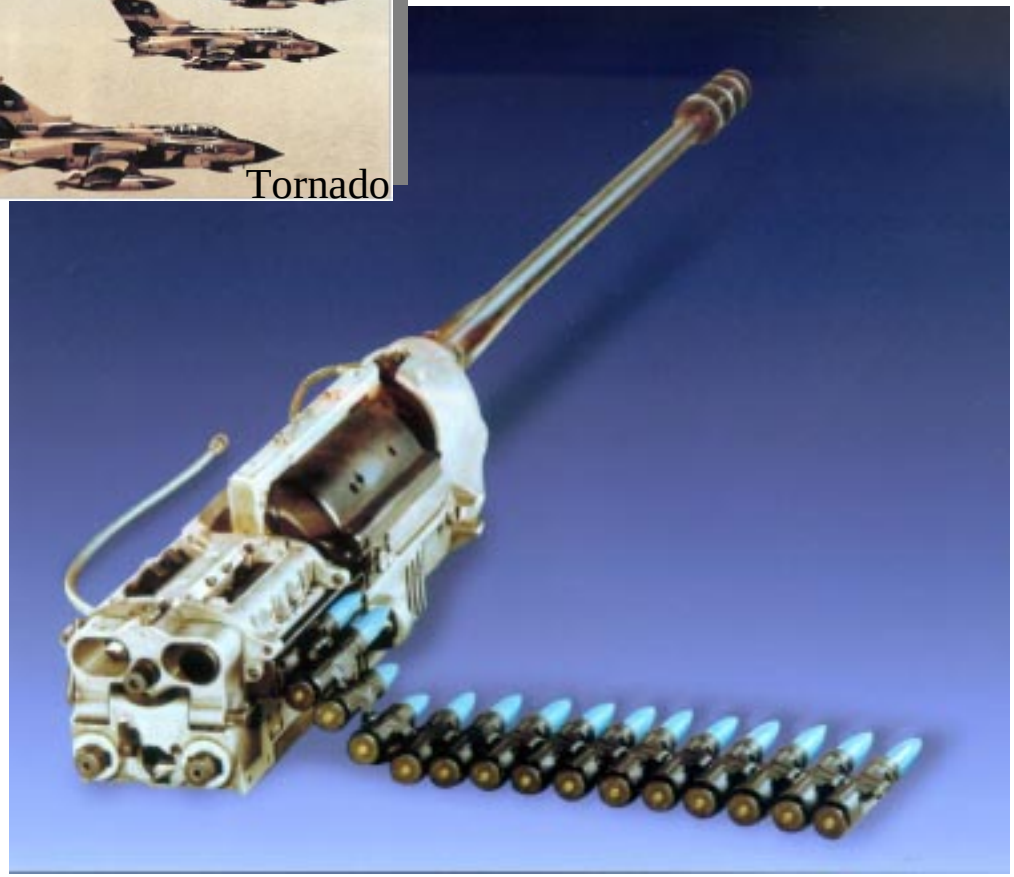
FCS (Minimum Configuration)

MAUSER

Member of Rheinmetall Group

MN 27/30 GS

Tornado



EF 2000

Gripen AS 39

BK 27

MAUSER

Member of Rheinmetall Group

MN 27/30 GS

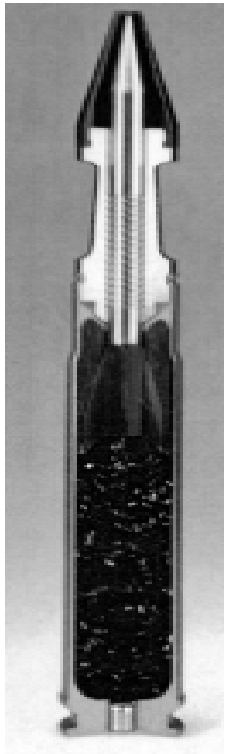
BK 27 mm x 145

BK 27 mm	• In Service (Tornado, Gripen AS 39) Selected for EF 2000 Under Evaluation for the JSF in the US
Type of Weapon	• Gas-operated, Five Chamber Revolver Cannon
Rate of Fire	• Switchable: 1,700 / ~1,000 Rpm Rapid Single, Controlled Bursts
Reliability	• MRBF 10,000 Rds
Navalization	• Tested and Qualified during CIWS MIDAS / DRAKON Development
Recoil Force	• .9 kN - 28 kN
Weight	• 110 kg

MAUSER

Member of Rheinmetall Group

BK 27 Ammunition Family



Anti Air	HE	High Explosive
	HESD	HE Self Destruct
Surface and Shore Targets	AP	Armour Piercing
	APHE	AP High Explosive
	APHESD	APHE Self Destruct
Surface Targets extended Range	FAPDS	Frangible Armour Piercing Discarding Sabot
Anti Missile	APFSDS	Armour Piercing Fin Stabilised Discarding Sabot
Training	TP	Target Practice
	TP-T	TP-Tracer
	TP-FP	TP Frangible Projectile

MAUSER

Member of Rheinmetall Group

Ammunition Performance

	27 mm x 145	30 mm x 173
Rate of Fire (rds/min)	1700	800
Full-Calibre (HE):		
Muzzle Energy (kJ)	113	220
Weapon Performance (kW)	3250	2928
Projectile Velocity (m/s):		
0 m	1025	1100
1000 m	695	791
2000 m	414	545
3000 m	286	350
Sub-Calibre (APFSDS):		
Muzzle Velocity (m/s)	1100	1450
Muzzle Energy (kJ)	97	158
Weapon Performance (kW)	2759	2219

MAUSER

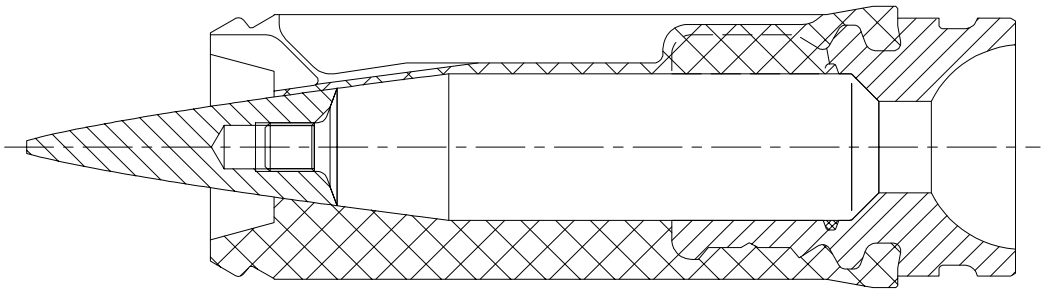
Member of Rheinmetall Group

MN 27/30 GS

27 mm x 145 FAPDS

A new war ammunition for the NAVAL GUN MOUNT

projectile mass:	230 g	v_0:	1100 m/s
penetrator mass:	175 g	v_{1000}:	970 m/s
accuracy:	0,3 mrad	t_{1000}:	0,95 s



Frangible tungsten heavy metal penetrator,
combined aluminium - plastic sabot with integrated driving band

MAUSER

Member of Rheinmetall Group

27 mm x 145 Ammunition

FAPDS

Short Time of Flight

Low Drag Coefficient

Low Dispersion

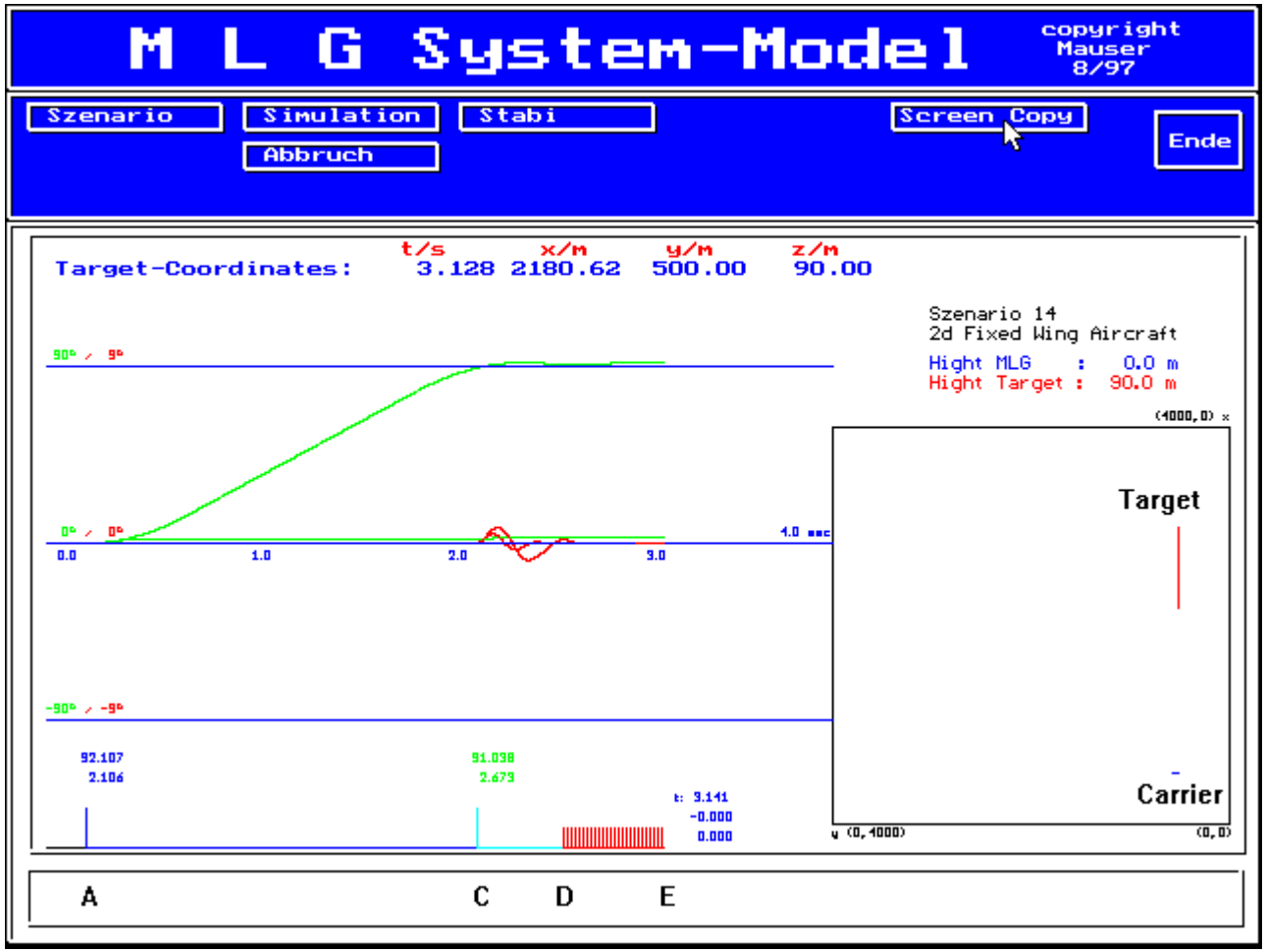
High Penetration Capability

High Secondary Damage (Fragmentation)

Training Ammunition

In Service, Cost -efficient

MN 27/30 GS

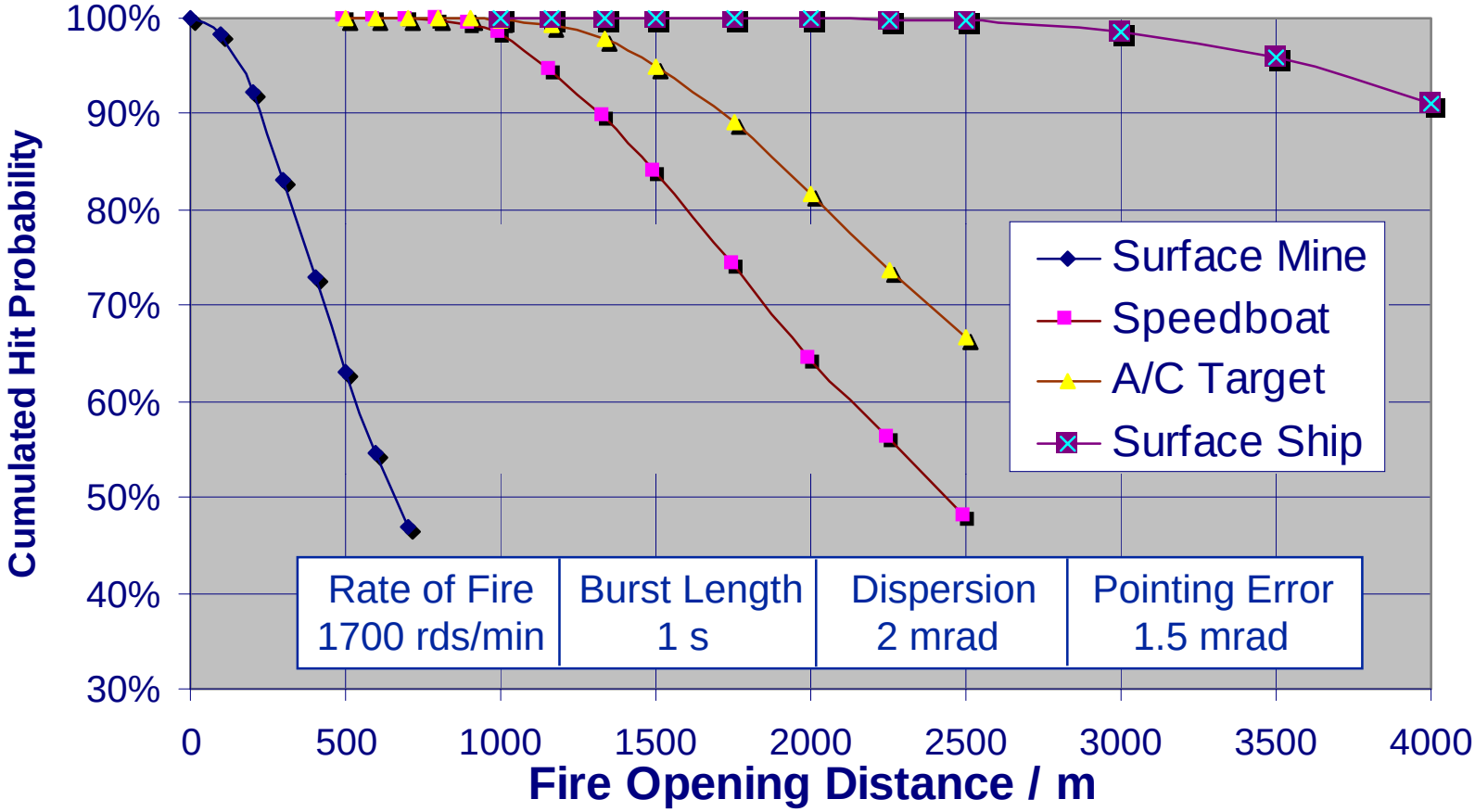


MAUSER

Member of Rheinmetall Group

MN 27/30 GS

Probability of Hit



MAUSER

Member of Rheinmetall Group

CIGS (Close-In Gun Support) Configurations

BASELINE
- Identical to *Autonomous Mode (2) Semiautomatic* except for the missing Tracker

VARIANT 1
- Identical to *Autonomous Mode (2) Semiautomatic*

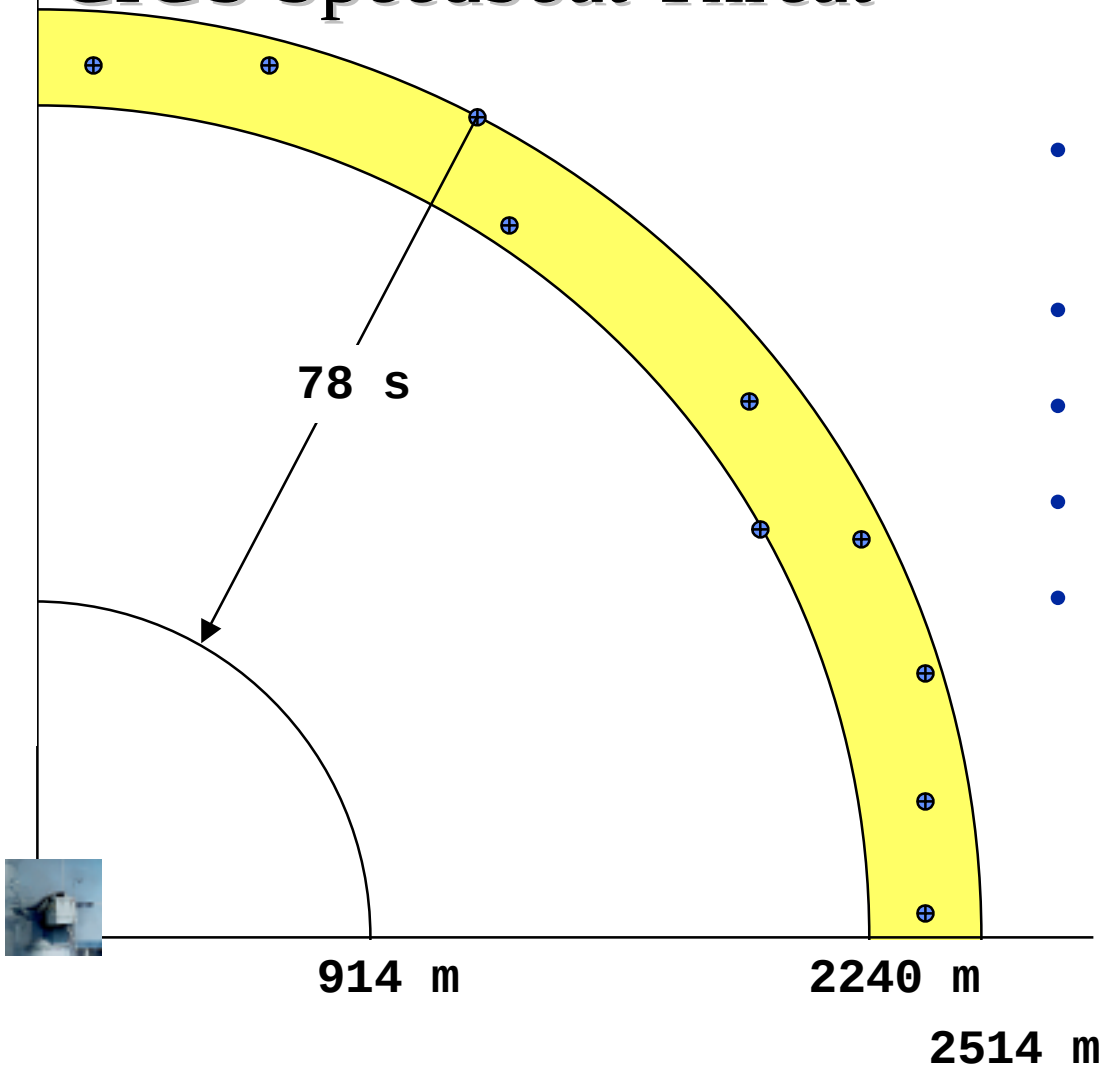
VARIANT 2
- Identical to *Depending on NCS (3) Automatic Mode*

CIGS Threat Scenario

- 10 radially inbound craft
- travelling at 40 kts
- in a 90° arc and
- in a 300 yds (274 m) range band to be
- defeated outside 1,000 yds (914 m) from the carrier

MN 27/30 GS

CIGS Speedboat Threat

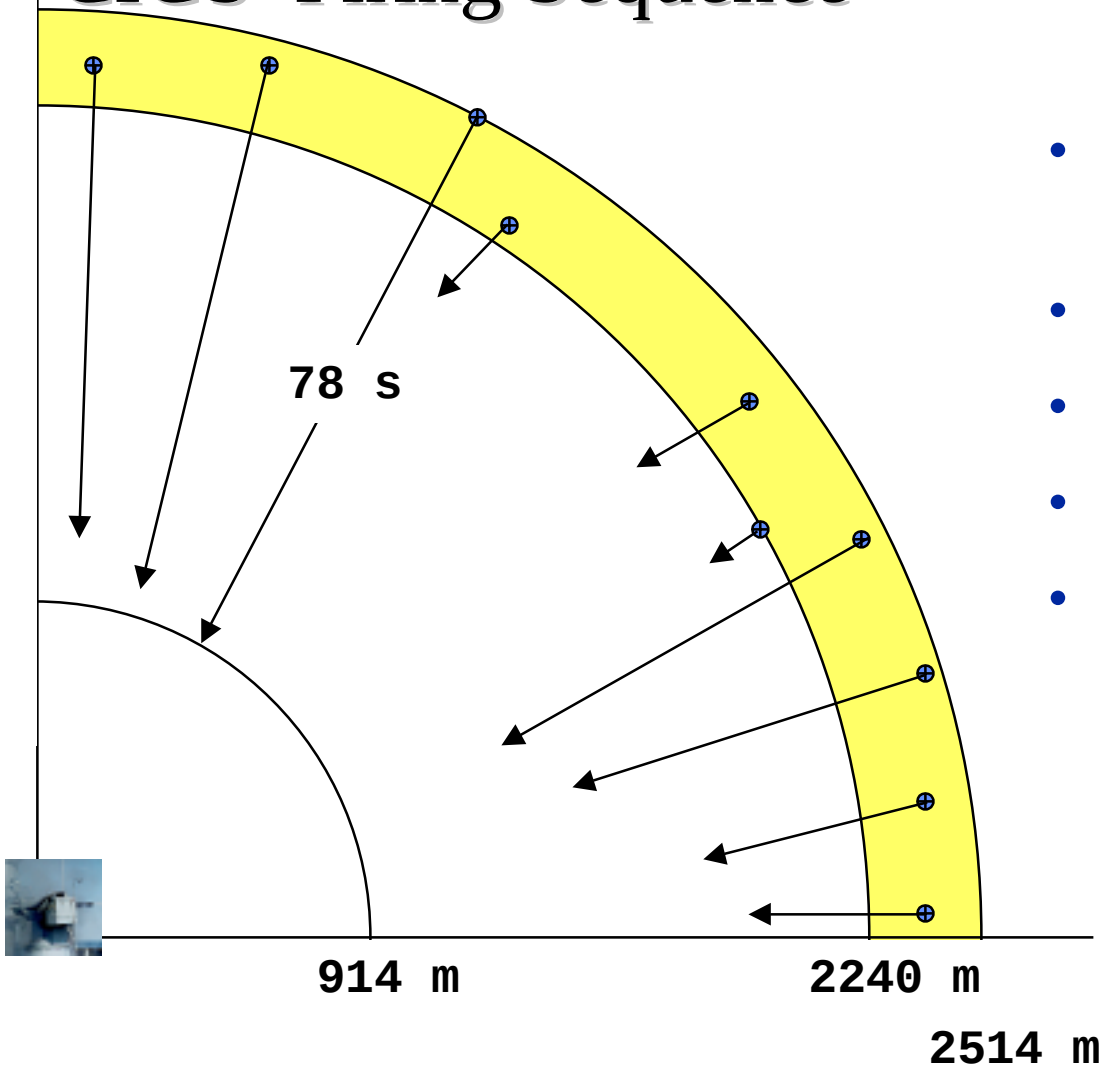


- Ammunition Magazine Capacity: 135 rds
- 13 rds per Engagement
- Burst Length: 0.46 s
- Reaction Time: < 7.5 s
- Resulting average kill-probability: **85 %**

MAUSER
Member of Rheinmetall Group

MN 27/30 GS

CIGS Firing Sequence

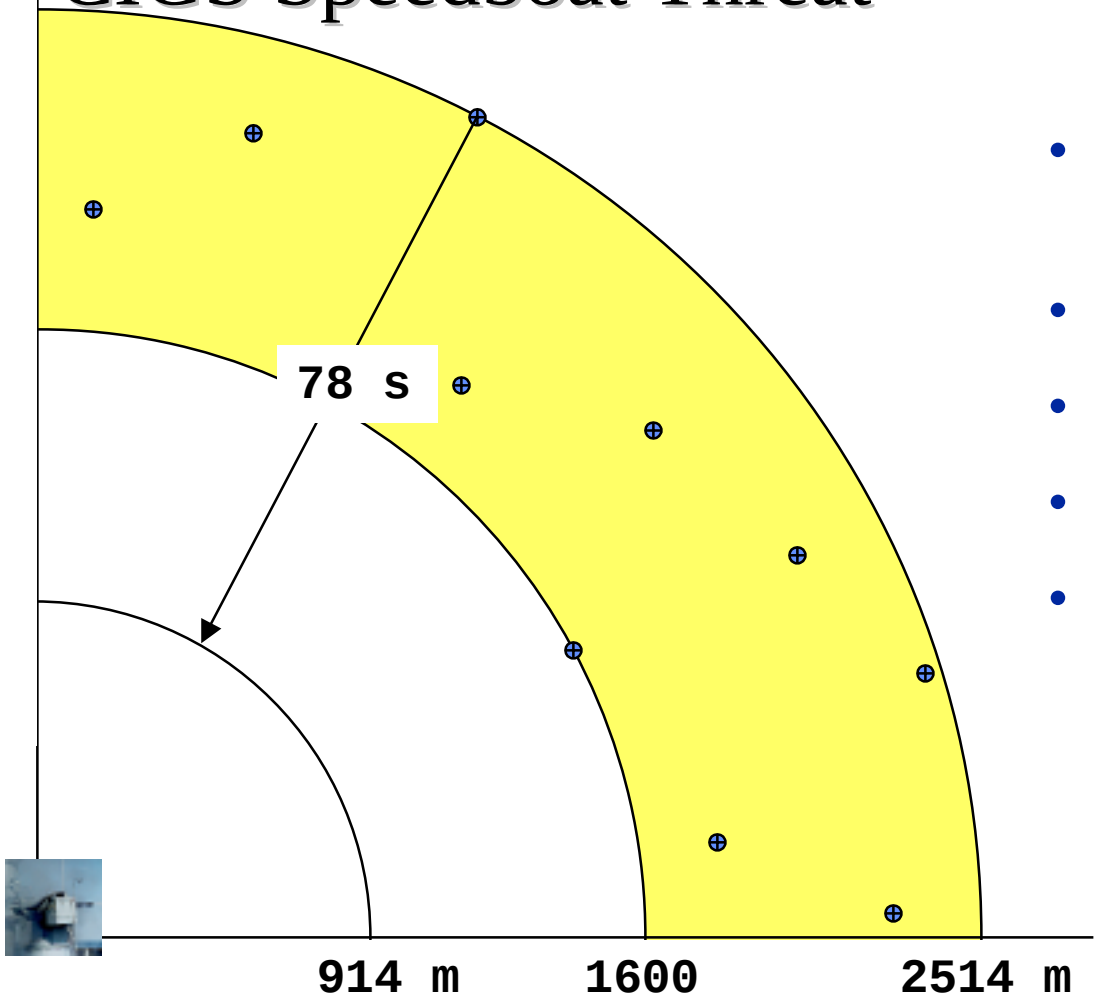


- Ammunition Magazine Capacity: 135 rds
- 13 rds per Engagement
- Burst Length: 0.46 s
- Reaction Time: < 7.5 s
- Resulting average kill-probability: **85 %**

MAUSER
Member of Rheinmetall Group

MN 27/30 GS

CIGS Speedboat Threat



- Ammunition Magazine Capacity: 135 rds
- 13 rds per Engagement
- Burst Length: 0.46 s
- Reaction Time: < 7.5 s
- Resulting average kill-probability: **95 %**

MAUSER

Member of Rheinmetall Group